Space Weather Forecast

Issued on Saturday, 23 December 2023 at 12:36 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of isolated M-class X-ray flares throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been low throughout the past 24 hours, with only Common-class flares observed. The X-ray trace generally showed a downward trend, but began to pick up late in the period with a peak flare from a sunspot region in the northeast observed at 23/0914UTC.

There are now eight sunspot regions on the Earth-facing side, with the recent most active now indistinct on the western solar horizon, as a second group faded in the north-central part of the Sun.

Figure 1: Past three days to 23/1200UTC of common-class flare detections and above, courtesy of SIDC ROB. Note the dominance of an off-going sunspot region in the lower right – this is the rationale for the imminent step-wise fall in daily risk of further significant flares.

Magnetic solar imagery is relatively starkly polarised at present, which is proving a fertile breeding ground for 'filaments' (arcs of plasma) on the boundaries of these areas, however the majority of these remain apparently well-anchored at the time of writing. The main exception to this was a large filament near 20 West that went through periods of disturbance. It is not yet clear from imagery as to whether any of these restive periods produced any Coronal Mass Ejections (CMEs), however this is the main source of monitoring.

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A narrow CME was tentatively identified into the current UTC morning, seen heading apparently largely south of the Sun-Earth line on imagery. The source, while uncertain, could be a minor coronal dimming in the southwest of the Sun around the turn of the current UTC day (i.e. straddling 23/0001UTC), with the ejecta apparently then angled slightly east and down of its apparent emission source. This feature has been analysed and modelling results are awaited, although it appears too narrow to feature significantly. At the time of writing then, no definitively Earth-directed CMEs were in evidence.

Solar Wind / Geomagnetic Activity: Solar winds have been characterised by a slow solar wind regime in the past 24 hours, with the speed, number of particles and their associated magnetic field all stable and within typical background levels. The net result of these measures was for resolutely quiet geomagnetic activity.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Low activity is forecast, with a chance of moderate activity. A slight reduction is forecast from 24 December as the recent most active region rotates off the facing side.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs are forecast. Solar wind speeds are expected to remain at background levels in the absence of fast wind streams from 'coronal holes' or significant CME arrivals. Geomagnetic activity is expected to remain largely quiet.

Energetic Particles / Solar Radiation: There is a slight chance of solar radiation storms, should there be any larger flares on the western side of the Sun.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

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Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	40	30	30	30
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	10	10	10	10
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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